SCIENCE

FRIDAY, AUGUST 29, 1919

CONTENTS

Official Field Crop Inspection: H. L. BOLLEY. 193

Courses in Physical Measurements for Students of Chemistry and Related Sciences: DR. PAUL E. KLOPSTEG 199

Patent Reform Prospects: BERT RUSSELL 202

Scientific Events:—

Memorial to the late Frederick du Cane Godman; Exhibit of Marine Camouflage; The Philadelphia Meeting of the American Chemical Society 204

Scientific Notes and News 206

University and Educational News 208

Discussion and Correspondence:—

The Valence of Nitrogen in Nitrous Oxide: WILLIAM T. HALL. *A Snow Effect:* LEON ELMER WOODMAN. *On Measuring the Density of the Seventeen-year Locust Population:* DR. ENOCH KARRER 209

Scientific Books:—

Huntington's World-power and Evolution: PROFESSOR CHARLES SCHUCHERT 211

New Activities in the History of Science: PROFESSOR LOUIS C. KARPINSKI 213

Special Articles:—

The Motion of a Gravitating Needle: PROFESSOR CARL BARUS 214

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

OFFICIAL FIELD CROP INSPECTION

Now, when it has been forcibly brought out that the nation is vitally interested in farm results and that to get maximum production, some system of efficient supervision is essential it may not be out of place to call attention to a line of work in which official supervision would be beneficial and for various reasons quite essential, even under normal conditions. There is a phase of farm cropping, especially with cereals, in which the state is not only vitally interested but could become of great aid to growers, and to the consuming public. That line of work may perhaps be properly named official field crop inspection.

Great strides have been made, from the educational standpoint, in crop improvement during the past twenty-five years. It is apparent, however, to those who are closest to the work that improvement in cereal cropping is not nearly proportionate to the general gain in information as to possible cropping methods. There is much knowledge as to tillage, crop rotation, seed breeding, and much improvement in farm machinery and methods of crop handling through farm machinery; yet the processes which, from a scientific standpoint are necessary to high production of yield and quality are not in common practise and, when used, are so intermittently followed as to cause failure of crop improvement that should otherwise naturally follow.

If the above is true, it is worth the attention of those of us who are specialists in certain lines of agriculture to try to determine the reasons for such failure to follow best processes and to arrive at a remedy along the lines which may result in getting the process constructively carried on.

For example, much work is done in breeding seeds. The states and nation are at much expense to allow certain experts to study Men-

delian methods of cross-breeding and other lines of work which result in the introduction of new varieties and kinds. Certain business men who are concerned with the results are not backward in saying that this introduction of varieties is often harmful rather than beneficial and those of us who are close enough to the field to note the results are perhaps willing to admit that many valuable varieties are so intermixed and so jumbled as to merit such disapproval.

It is safe to say that in cereal agriculture varieties are not kept separate, and are not handled in the same intelligent method as that which characterizes the best fruit and vegetable growing methods. Is there any reason why such should be the case?

Again, as I have pointed out in other addresses, though most agriculturists and many able farmers are convinced that a crop rotation is a necessary process for best seed and crop production in cereals, yet, there are few crop rotation series which are recognized for any particular region which are carried out with any consistency. There must be some general reason which accounts for such failures to apply the principles, methods and teachings which all of us and many able farmers believe in.

I do not wish here to enter into a discussion of crop rotation, soil tillage or purely sanitary matters of cropping, but will call attention to one phase which I think illustrates the way out, so that processes known to be necessary may be constructively continuous. I advocate a legal basis for bringing about stability and standardization of varieties in cereal cropping. I believe that there is good excuse for official supervision of seed production and distribution.

I am not, I believe, unduly optimistic when I affirm that under properly systematized seed standardization and sanitary cropping through means of proper handling of the soil and seed, any state or the nation might readily lift its annual average yield of wheat several bushels per acre per year. I think that a minimum increase of five to ten bushels per acre for proper systematic handling of the seed crop might not be beyond reasonable expectation. Further, I believe this would be doubly assured were it no longer possible for a man to plant the same general crop two years in succession on the same land. For the land control proposition, we may not yet be ready, but certainly, for the seed control proposition we have reached the stage when it is folly to claim that further improvement can be made by simple process of education when almost all the processes of marketing and general farm procedure are so conducted as to offset any improvement that can be made by intermittent educational processes, however effectively administered. I need not only call attention to the fact that there are very few new varieties of cereals which remain in reasonably pure form past the third generation on the farm and in the market. Very few of the wheats in the leading districts survive a decade before they are replaced by some new creation which runs perhaps only a shorter more precarious existence.

Opposition to Progress.—Many of us are prone to descant on the initiative being left in the hands of the farmer and many in the business world or manufacturing side are pretty sure to decry any attempt to improve matters by the enactment of law. I am quite convinced that laws which are enacted but never put into operation are useless. I am also convinced that those which are enacted and put into operation and which remain in operation, such as the sanitary laws for the control of Texas fever, smallpox and compulsory disinfection after diphtheria, scarlet fever, etc., are laws which should have been enacted and which, because they are still in force, prove that there was a necessity for such enactment. I also believe that it will be understood that many laws are enacted which do not need to be enforced. They form the educational basis for stable processes. Many good laws are self-operative. Such laws remain on the books as a basis and guide for those officials whose business it is to advocate progressive advance. Such law, for instance, is the ordinary anti-expectoration law. It was easy to make fun of and to say that it

was unnecessary and that everything could be done by education, but who among us will contend that such criticism or opposition was well founded?

Nevertheless, when we strike the matter of farming processes and indicate that there should be sanitary laws affecting farm processes, officially supervised by state officers non-amenable to politics, etc., there are many who object and say that such laws are unnecessary and that we should "rely on educacational methods," indicating that too much supervision will bring about stagnation, etc. Then there are others who are sure to call such laws "sumptuary," etc., tending to prevent individual freedom of action and toward depression of business operations.

In years past we have gone so far in this laissez faire line of non-control of farming matters that any approach to supervision by the state of any farming work is sure to be resented by some line of business, even though it meets with favor in the eyes of those for whom it is intended to directly help. Thus, for example, there are few of us but can remember the strenuous efforts to resist fertilizer control lines of work, and the strong opposition to enactment of horticultural and entomological supervision for control of insect and fungus pests, and to the enactment of simple seed inspection laws. Even now, in the work of plant disease control, it is apparent that there are yet those who insist that the state should keep out; that there should be no supervisory laws affecting control work. When, for example, but lately it was proposed that the states and nation should attempt control of wheat rust through barberry eradication, there were not a few who should know most as to the reasons for the necessity of such eradication, who spoke out freely and feeling in the advocacy of a "campaign of education" and as though we had not had that campaign for nigh on to two centuries. And now, if one should but propose compulsory seed treatment for cereals for prevention of smut and control of scab and similar cereal diseases, or a law simply to prevent continuous cropping of the land so that there might not be a continuous accumulation of such diseases in the soil and seed of special crops, there would be many so-called "educated men" who would throw up their hands in feigned horror. Yet enactment of such soil seed laws would be but a natural consequence following upon years of investigation and established knowledge relative to what should be done in order to control such cereal diseases. In other words, it would be but a natural step toward carrying out present knowledge of cereal control through sanitary methods so that the work done may not be continually and perpetually a loss through the carelessness of ordinary marketing and farming processes.

I discuss this phase of the sanitary question as to soil and seed only to introduce the idea of the necessity that the states attempt by law to standardize seed quality through proper methods of seed cropping and seed control.

I propose the thought that many of our so-called "educational campaigns" need a basis of equitable law. One can not expect sanitary or proper planning to be carried out merely on the suggestion of a professor from the agricultural college or of an extension worker if the carrying out of the processes must be placed eternally upon the utopian basis that the man who does the work may hope for some results but whether he does or does not get them he *should* and *is expected* to do it so that his neighbor may also prosper. Merely to recite to him that the public should have the benefit of the better crop that he will raise loses force after a time except it be backed by an emergency such as has come about under war conditions. It is too great a strain on the word "loyalty" to ask it, unless asked of all. In fact, the work will not be done with sufficient unanimity to give worth while results except it be done by all continuously, year by year. The proper basis for sanitation on the farm as to crops is not different from in the home, factory and school. It should rest on equitable law, educationally and equitably administered. I believe that the first step in cereal crop improvement rests in a further extension of

our state seed and weed laws and in the activity of the forces represented by them, to include proper control of seed crop production and of seed and grain distribution.

Present Status of Seed Production, Cropping and Marketing of Cereals.—In the line of cereal cropping and marketing we are not progressing as fast as the growth of our population calls for. The increase in population and of the population of the world, even in peace time, calls for a marked increase in cereal crop production. This increased demand has brought the total acreage of the wheat crop in the United States close to the maximum acreage at which labor is available for its production, and, what is worse, has reached such a high annual acreage in the chief regions of wheat culture that it is becoming extremely difficult to plan a rotation which will give sufficient improvement in the sanitary status of the soil as to crop refuse as to allow of seed improvement. In spite of our knowledge in the matters of sanitary cereal cropping no consistent steps are taken to bring about such uniformity and continuity as may be likely to tend to improvement either in the seed quality used in bulk, from year to year, or in crop quality.

These conditions result from: (1) The failure of our educational campaigns to prevent the constant cropping of the soil to one crop or its close disease infected cereal relations, and (2) the failure to hold varieties up to the standards of purity necessary to meet cropping and marketing needs. In the chief areas of cereal production, whether we mean wheat, oats, barley or corn, constant cropping prevail as against constant processes of sanitary crop rotation. Particularly in wheat, barley and oats cropping, the chief methods of production violate all the rules relative to standardized seeds more commonly than they are practised. Here the large acreage producers and the elevators and processes of marketing, speedily undo all the ideas of crop sanitation and grain standardization. At least, they speedily bring the entire mass to an equilibrium of minimum yield and uniformity of admixtures. As the country elevator furnishes the chief supply of seed for the general cropped areas, an area of wheat does not represent one of one variety but of several and of many types of infectious diseases which accumulate in seed and soil. In other words, we have no reliable basis of holding a crop to standardization; and the work of each cereal crop improver and public educator on breeding dies with him. As to the truth of this, one could cite many instances as Wellman, Haynes and Saunders.

These are strong assertions but are easily maintained to the satisfaction of any person who knows field and market conditions. In the corn states, corn culture is so overdone in large districts that the soil and seed is so contaminated with Fusarial types of fungi and other corn root and seed infecting organisms that the seed is generally reduced in vitality and the soil is so infected that in spite of the cultivation which is a necessity in that crop, good disease-free seed often fails to properly germinate in good *fertile* soil. This is but the story of the cotton crop, the flax crop and the wheat crop over again.

The Way Out.—Without attempting to further argue the matter, I propose in every cereal-producing state a law authorizing seed, field crop inspection, seed certification, seed standardization and seed sales lists, all to be done under supervision of an officer who holds his position not through local or political appointment, but because of his position as an investigator and educator associated with and directed through the proper educational board. The law should be of such scope as to afford the basis for proper educational propaganda which would come as a necessary adjunct of a law which should carry sufficient funds to allow of demonstrations and field work in the laying out of seed plots for standardization work. It should carry sufficient funds to allow of proper survey of every township so that there should be at least a local supply of seeds grown which may be looked upon by the residents of that township as standard stuff of a given variety, and so inspected that it is reasonably free from the infectious diseases characteristic of the crop. The law should be

equitably drawn and should be so worded as to allow enforcement in the face of wilful violation.

It is, I think, self-evident that the work of crop inspection, standardization, certification and seed listing should be free—open to all so far as done—for it is for the state, for all citizens, consumers as well as growers. Further, those who do the certifying and listing should not be dependent for their position on the number of bushels standardized, certified and listed. This is perhaps the chief argument against the fee system. No citizen should be able to charge or think that the *fee* pays for the work.

It may be asked why the necessity? Simply because: (1) The states and nation are creating many varieties, perhaps valuable ones at great expense, only to be lost inside a few seasons of general cropping and marketing through admixtures, disease contamination and deterioration. If not lost their qualities are quite camouflaged by the products obtained. (2) Seed inspection laws which only inspect in the bag or bin in the place of seed sales after the seed is sold off from the farm have failed and are failing to insure seed and crop improvement.

I do not mean by this that such inspection laws have not prevented the sale of much worthless seed. For under the present seed laws it has been possible to prevent the sale of large quantities of perfectly non-viable seed and it has been possible to prevent the sale of seeds containing quantities of noxious weed seeds. It is not in this sense that I claim they have not succeeded, but rather that inspection after the crop is sold can not improve the crop. Indeed, it may even deteriorate until there is really nothing worthy of the inspections and analysis wasted upon it. The seed merchant can only sell that which he buys and that which he buys can not be better than that the farmers grow. It is thus evident, if we are to improve that which is grown, the inspection must be commenced earlier and with the cropping processes. One can not improve that which is in the bin by inspecting it, he can only refuse to allow it to be sold until graded or cleaned, etc. As, however, the admixtures are usually such that cleaning machinery can not remove them, no amount of inspection will improve the breed and sanitary qualities for seed at this point. If the inspection starts on the farm and goes into operation with a view of aiding the grower to produce a better crop to be sold for seed for sowing purposes, or even for commercial purposes, then the money involved in the inspecting and in educating the public acts directly and readily leads to an improved pure-bred seed plot and within two to three crop generations to an entire farm crop of improved or pedigreed seed in sufficient quantity to fill wholesale seed house or manufacturing wareroom. A sufficient number of such properly inspected crops will provide for the township and county needs, and the process soon becomes infectious on adjacent farms. Thus standardization of varieties and proper recording of the growers may be established and through authorized lists the grower of improved or pedigreed seed may be brought into authentic touch with those who wish to use the seed on the land. Seed inspection thus becomes at once a constructive process for improvement of seed quality and a means whereby records may be established and kept so that the breed may not be lost through misrepresentation or ignorance.

Some may say that this can be done through cooperative breeders associations and by constantly renewed educational campaigns. That this is not possible, never has been done and can not be done because there is no tie to prevent such organizations running wild or dying when the originators die is self-evident and a fact of history. Such organizations usually die a natural death through the action of greedy members and false advertising propaganda. Who is there to check up the cooperative breeders associations? Seed improvement must last through the life of many men and for this there must be plans based on established law.

The one thing that can be said about our present haphazard method of breeding, seed recommendations and educational propaganda

is that all die out. Through this system or utter lack of system there has accumulated an enormous number of synonyms, and numerous varieties mixed and jumbled into junk lots and misbranded kinds and the nation quarrels as to how such cereals may possibly be graded for commercial purposes. These methods with the craze for introduction of new kinds and the accompanying fallacies that varieties run out have so beset our agricultural public and plant breeding workers that many able men are spending their time on the study of synonyms and the separation of varieties which, were the tasks accomplished, would be lost within three years should they cease their labors.

Even in potato culture there are getting to be so many varieties and so much disease contamination in the chief potato districts that one can scarce load a car of a single variety reasonably fit for use as seed or even commercial marketing without hand selection and disinfection. What then must be the status with reference to wheat, oats and barley?

The average person seldom sees anything smaller than potatoes and walnuts accurately, and this is literally true in regard to cereals. Some claim there is no necessity for such work because the national grain grades will eventually take care of this matter or should take care of it. Nothing can be farther from the fact. Nothing can be farther from possibility; for the national grades do not recognize variety. All hard spring wheat looks alike to the elevator and commercial man regardless of the variety. In milling and for feed purposes in actual fact, it should make little difference. These should not concern themselves with variety further than the matter of kind. For commerce and manufacturing national grades are an essential necessity in order that all may be properly safeguarded. They should recognize qualities as hard and soft, damp and dry, bright and mouldy wheats, etc., but they have little concern with variety. If they should, under present conditions there could not be constructed sufficient elevator bins to separate the varieties in any large cropping district. In fact they do not. The fact that a sample of wheat is of no. 1 cereal quality as "no. 1 hard spring," does not at all insure its seed value. It may bear all the weed infection, disease infection and types of wheat admixtures, to which that particular region is heir, and the more the national grading system attempts to separate varieties in the grading system, the more certainly will their processes be damaging to agriculture.

The seed proposition must stand on its own merits and must be recognized as separate from the manufacturing proposition. If we care for crop improvement we can not allow the seed standards in cereal cropping to be based upon national standards for flour and feed manufactury. Nor can we as agronomists allow those in charge of the national grades to claim without rough challenge that they are protecting the varieties. As long as our farmers believe or are taught to believe that they have some protection from this source it will be possible for our wholesale seed houses to buy "no. 1 northern spring" or whatever the designation may be and sell it back to our farmers for seed as a basis for crop production.

Field Seed Crop Inspection.—The process of proper field crop inspection for seed production and seed standardization is a very simple one when properly authorized and put into operation. It can be done under any conscientious educational official administration of the state and can be continuous from one generation of officers to another without loss of the underlying methods and records. The natural home of such crop inspection would be associated with the work of the agricultural college and experiment station, where experts should exist or where it should be possible to develop experts in seed and crop standardization. The work can very naturally and properly be centered around the work of the pure seed office of the state. In its essentials it consists in the sending of competent inspectors to inspect the growing crop of those who claim to be growing seeds for sale for sowing purposes or for special commercial enterprises. This inspection of the crop or stock may be

done at any time before the same is sold off the farm on which it is grown, but the proper time for such inspection is when the grain is in head, when even a novice in agronomic or botanical work need make no mistake as to variety and the percentage of possible admixture and the possibility of disease infections, as scab, rust, ergot, smut, etc. A certificate should follow final inspection of the seed in the pure seed laboratory following harvest and threshing. A state list should be published showing the name of the grower, his address, the variety and amount of seed saved for sale as seed and its authorization should be based upon the certificates as issued. Such state laws should specify various grades of improved grain as "bulk seed of sufficient purity for use in special commercial processes, or in general cropping as improved seed, or as pedigreed seed, etc."

Suffice to say that this state listing necessitates official records of pedigrees and makes possible standardization and retention of varietal standards of quality. The whole process tends to form a proper educational basis for seed and crop improvement. Finally, the lists put any man who wishes to use the particular seed in touch with the man who is able to provide it. Thus good seed gets used on the land. The grower and the public is assured against having the work of proper tillage and proper crop rotation destroyed or set aside through the use of false unknown or deteriorated varieties. The whole process tends to insure final crop standardization and is the necessary foundation for final establishment of marketing standards.

In North Dakota the process here outlined is not a matter of theory but has been in operation on a part of the crops since 1909, and quite extensively in operation since 1911. Some hundreds of thousands of bushels of seed have been sold under the state list. We have made a beginning step on the right road looking toward cereal crop improvement. When a farmer or wholesale seed merchant once becomes imbued with the idea of standardized seed of a known quality, sold under certification. and if necessary under lead seal, he at once sees the necessity of following other processes of crop improvement which follow as natural corollaries, thus one will not be apt to put such seed into the lands which are weed infected, disease-infected, or contaminated with other sorts of grains of the same kind, or junk the bulk product with inferior stuff on the commercial market. Improvements in lines of tillage and crop rotation must and will follow upon seed standardization as naturally as day follows sunrise. At present there is no real necessity of much improvement in tillage and crop rotation methods; for the seed used, very often, is of such quality from a sanitary and breeding standpoint, as to thoroughly offset any improvement that might be expected from better tillage methods, and improved methods in soil sanitation.

H. L. BOLLEY

AGRICULTURAL COLLEGE, N. D.

A PLEA FOR COURSES IN PHYSICAL MEASUREMENTS FOR STUDENTS OF CHEMISTRY AND RELATED SCIENCES

IT has been my privilege during the past two years to visit many institutional and industrial research laboratories in various sciences and I have had the opportunity of talking with many workers in these laboratories. Before that time I had spent a number of years in teaching and research in physics. Recollections of that experience, together with observations which I have since been able to make, have forcibly brought to my mind certain convictions which I desire to express, in the hope that such expression may contribute to establishing a basis for definite progress in certain kinds of research.

What is here set down may be common realization, and it may have been expressed before. If so, this will emphasize previous remarks upon the subject; and such emphasis seems to me to be much needed.

It is probably the experience of many scientific workers at some time or other to feel that they are much handicapped by being not sufficiently familiar with the methods and the

theories of other sciences which have a direct bearing upon the work in hand. In discussing the subject, I shall confine my attention to the importance of a knowledge of the principles of physics and of methods of physical measurement in their bearing upon work in other fields. No doubt the arguments will apply equally well, in their general aspect, to any science in its relation to the others. My reasons for emphasizing physics are, first, that I want to confine myself to the facts with which I am most familiar, and second, that many of the measurements and experiments made in almost any science are purely physical, involving mechanics, sound, heat, light and electricity with its newest branch, radioactivity.

In engineering, the fact that physics is fundamental has been universally recognized, in some cases by presenting a more intensive, or a longer course in general physics, and in other cases by putting into the curriculum intermediate and advanced courses having a direct bearing upon the problems to be encountered later. Engineering is commonly spoken of as applied physics, and it is therefore to be expected that physics and its applications should occupy a large part of the engineering courses. Workers in those sciences which have more recently become experimental, and in those which, though having long found much of their advancement in experiment, are finding new experimental methods—these have not yet fully recognized the aid they might receive from physics. On the other hand, the physicist himself has failed to recognize the aid which his science might give. Consequently little has been done towards promoting the idea of developing courses in physics with reference to its applications to the chemical, biological and medical sciences.

The handicap of insufficient familiarity with physical measurements and technique, in the case of so many workers in the sciences, is no doubt due to the fact that the great majority of students in these sciences become so absorbed in their own problems, and see in their own fields so many immediate things to be undertaken that they are led to pay but scant attention to any others. Or, on the other hand, students follow a prescribed course of study, which may have been laid out without sufficient consideration having been given to the value of including in that course the sort of training which later might prove extremely useful if not indispensable.

It is true that some recognition has been given physics in all undergraduate courses looking towards graduate work in chemistry, biology, medicine, and in some cases, psychology. The future chemist or bacteriologist "gets" one year of physics, consisting of three or four hours a week of classroom, lecture and laboratory work, and this during his freshmen or sophomore year. An extra year may be added, perhaps, in individual cases, for more or less advanced laboratory work, upon the planning of which the instructor has unfortunately often spent too little thought to bring out fully its possibilities from the student's point of view.

Those who plan such a prescribed course of study may justly argue that the year of physics to which their students are now "exposed," even in classes made up wholly of chemical or premedical students, is too frequently "just physics," and that no emphasis is placed upon the relation of physics to the science in which the student is interested. To a certain extent, this is true. The physics instructor's failing must be traced back to the same cause, however, as an effect of which his knowledge of the other sciences is insufficient to enable him to apply his physics in the manner expected. But aside from this, there is so much ground to be covered in a single year that, regardless of the text used, the class must be carried along at a terrific pace, following the text as closely as it may, in order to cover the ground in the allotted time. *After such a course, it can not be expected that a student should retain much in the way of ability to apply physics to anything else when, at the end of the semester, the sum total of physics which he can successfully apply to the impending examination is so small!* Besides, most of the courses properly include physics in the fresh-

man or sophomore year, and the interval of two or three years until research is begun blots out much of what was actually learned. Consequently, when the student has arrived at the research stage he must, with much loss of time and with much effort, rediscover methods and devise artifices which perhaps are well known in physical technique.

We must conclude that if the physicist has realized the fact that so many measurements are essentially physical, and that it would mean much for progress in all branches of science if those engaged in scientific research of any kind had at their command more physics, he has been at fault in not sufficiently emphasizing these facts and in not offering such a sequence of courses in physics as would recognize them.

Bearing in mind that the time which could be apportioned to such work would probably at best be limited, I should say that, in addition to the regular course in general physics, there should be offered a course, preferably during the senior year, which might be designated "chemical and biological physics." Such a course should be planned to give the student who contemplates graduate work, as well as the student going out into industrial work after his graduation, those principles and measurements which are known to be fundamental in the kinds of work that might be expected to follow. I should plan to have such a course occupy at least the equivalent of three two-hour periods for one semester of sixteen weeks. The following general topics might be taken as representing the essential things from which as many might be selected as were considered advisable, according to circumstances. (1) The accurate measurement of long and short time intervals. (2) Measurement of temperatures by methods other than the mercury thermometer. Principles of pyrometry. (3) Temperature regulation and temperature regulators and controllers. (4) Principles of precision calorimetry. (5) The microscope; its theory, and application to the measurement of small lengths. (6) The reading telescope and its application to the measurement of small angles. (7) Measurement of refractive index; spectrometer and refractometer. (8) The spectroscope, and spectroscopic analysis. (9) Color and colorimetry; intensity of light and photometry. (10) The polariscope and polarimeter. (11) The galvanometer; its use as a deflection and as a null instrument. (12) Ohm's law; measurement of current and potential differences. (13) Electric power and heating. (14) Resistance measurement; Wheatstone's bridge, with application to measurement of electrolytic conductivity. The alternating current galvanometer as applied to conductivity measurements. (15) The potentiometer; application to measurement of thermoelectric forces, electrode potentials, ionic concentrations. (16) Electrometers and electroscopes; applications to measurements in radioactivity. (17) Principles of X-ray measurements.

Fortified with the essentials of such a course, the student would be well grounded for the physics of almost any problem of research he might meet. Certainly the "general physics" course would fall short of giving him anything more than a somewhat hazy idea of the instruments mentioned in the above list, and of the purpose for which they are used.

Putting this work in the senior or first post-senior year would have the effect of attracting students who have come to realize the importance of these things in relation to their future work. A well-defined motive is much to be desired in any course, and, such a motive existing, the course should prove very successful from the viewpoints of both student and instructor.

Some of the measurements above mentioned are described—not at all adequately—in manuals of physical chemistry; but there the object of the experiment is the *result,* not the *theory* or *technique* of the measurement. The logical place for such a course is in the physics department, by an instructor who has thoroughly familiarized himself with the student's needs, and who knows what applications may later be expected of the kinds of measurements he teaches. Such an instructor, I daresay, would render a valuable service to his colleagues in the other sciences in the capacity

of consultant, advising them upon the physical aspects of their research problems. Much satisfaction could be derived from putting one's best efforts into such work; for there would come out of it the consciousness of having rendered a valuable service to the cause of science.

Discussion of the question in these pages seems to me very desirable as an aid to the crystallization of ideas regarding it. It is hoped that eventually sufficient interest may be aroused in the idea of making physics more valuable, to bring about the establishment in our colleges and universities of courses along the line which has been pointed out.

Paul E. Klopsteg
Leeds & Northrup Company,
Philadelphia

PATENT REFORM PROSPECTS

The initial patent reform measures advocated by the Patent Committee of the National Research Council (as noted in Science, April 11, 1919, No. 1267, p. 356) have been introduced by Chairman John I. Nolan, of the House Committee on Patents under the following numbers:

H. R. 5011. Provides for the separation of the Patent Office from the Interior Department and its establishment as an independent bureau. This bill, if made a law, would take the Patent Office out of the position of one of a number of inconspicuous bureaus in a great department, and set it forth in its proper light as one of the really important branches of the government, exercising a vast influence upon the material and industrial prosperity of our people. It is believed this change would greatly extend the activities of the Patent Office with a resultant stimulation of invention in various lines, and that it would open the door to numerous important reforms.

H. R. 5012. Provides for a single Court of Patent Appeals. The purpose of this court is to shorten the processes of patent litigation and to unify the decisions rendered in patent cases.

H. R. 7010. Provides for increases in personnel and in the salaries paid in the Patent Office. This legislaton is shown to be absolutely indispensable, owing to present outside competitive conditions, in order to obtain and retain the services of competently educated men as examiners. Good men are resigning to take positions with big industrial firms paying large salaries. The Patent Office has long been working without a sufficient force of competent men; its work is consequently in arrears, and the work is done too hastily to be reliable. The bill provides for a considerable increase in the working forces, and fixes a range of salaries for examiners, running from an entrance salary of $1,800 up to $4,000 for primary examiners with corresponding increases for higher officers.

Public hearings on the foregoing bill were held, commencing July 9, by the mentioned House Committee. This committee includes at the present time the following Republican members in addition to Mr. Nolan: Florian Lampert (Wis.), Loran E. Wheeler (Ill.), Albert H. Vestal (Ind.), Wm. J. Burke (Pa)., Albert W. Jefferies (Neb.) and John C. McCrate (N. Y.). The Democratic members are: Guy E. Campbell (Pa.), John B. Johnston (N. Y.), John J. Babka (Ohio), Edwin L. Davis (Tenn.) and John McDuffie (Ala.), but not all members mentioned were present at any one session of the committee. Every member that attended participated to a greater or less extent in the asking of questions of the successive speakers, Chairman Nolan and Representative Johnston being especially attentive and active in this regard, frequently giving distinct assistance in the emphasis or qualification of points made.

As secretary of the National Research Council's committee, Mr. E. J. Prindle had perfected the arrangements for these hearings, and by him the successive speakers were introduced. The first of these was Mr. F. P. Fish, referred to as the dean of the American patent bar. The short address of Mr. Fish will long be remembered by those who heard it as a wonderfully candid, comprehensive and convincing general statement of the importance of the patent system, of its decline, and of the utility or intended effect of the remedial measures under immediate consideration.

On the second day of the hearings Mr. Prindle, having interrupted his own remarks on the preceding day in order that Mr. Fish might be heard, completed a general exposition of the bills. He seemed to agree with Mr. Fish in placing a primary emphasis upon

the need for a Court of Patent Appeals—for which he also advocated that shifting personnel proposed by H. R. 5012 and apparently regarded with some disfavor or doubt by the members of the House committee.

Dr. L. H. Baekeland, acting chairman of the Patent Committee of the N. R. C., presented the convincing testimony of a successful individual inventor as to both the importance of patent protection and the wastefulness of the present system—or lack of system—in patent litigation. He agreed with the preceding speakers in urging the indispensable importance of better support for the Patent Office. Mr. Baekeland was followed by former Commissioner Thomas Ewing, who emphasized the essential distinction between the *registration* system and the distinctively American or *examination* system of patent grants. Mr. Ewing pointed out that the effect of inaction on the part of Congress is the slow transformation of ours into a mere registration system, very discreditably camouflaged. He strongly advocated separation of the Patent Office from the Department of the Interior as indispensable to the normal development of the Office and the attracting of strong men to its service.

Mr. Ewing was followed by Mr. Wm. J. Kent, an inventor from the development department of the U. S. Rubber Co., Mr. Milton Tibbetts, Chairman of the Patents Committee of the National Association of Manufacturers, and Mr. Elmer Sperry, whose inventions include many applications of the gyroscope. Each of these contributed materially to a composite but unitary picture of the present deplorable patent situation. There was substantial agreement as to remedies.

On July 11, Judge Learned Hand, of New York, presented an earnest plea for the proposed Court of Patent Appeals. He was followed by the inventor Frank Sprague, who related personal experiences of very great interest and significance, and by Mr. W. G. Carr and Mr. D. W. Holden, formerly of the examining corps and now connected respectively with the Westinghouse Electrical Co., and with the office of the Thomas A. Edison Co. All of these gentlemen, in addition to advocating the bill under consideration, responded to questions bearing upon the alleged practise of suppressing inventions (of which Chairman Nolan presented the striking instance of the automatic telephone) and, also to questions bearing upon a proposal by Mr. Edison calculated to protect an inventor from the complete alienation of his rights.

On Saturday morning July 12, Mr. C. L. Sturtevant, secretary of the American Patent Law Association, presented several specific amendments to H. R. 5011, relating to separation, disbarments and the like, some of these being matters of detail to which the Patent Office Society had previously called attention; and Commissioner Newton presented incontrovertible statistics as to the need of increases in force and salary, mentioning that the rate of resignation had risen to something like 25 per cent. per annum, and that, in response to about one hundred calls made upon the Civil Service Commission, that body had been able to send him only about a half dozen qualified men.

On Thursday, July 17, Mr. Thomas E. Robertson, president of the American Patent Law Association, reviewed the whole situation, and on the day following he gave the committee a "demonstration" of the work of a number of the examining corps. Mr. Bert Russell, secretary of the Patent Office Society, was heard briefly in defense of a compromise proposal regarding the personnel of the Court of Patent Appeals, and in regard to specific features of H. R. 5011, regarded by him as important incidents of the proposed separation.

It is expected that the record of these hearings will shortly be printed as a House Document.

On the whole, the attitude of Mr. Nolan's Committee was felt to be distinctly encouraging, at least as to the reporting favorably of some sort of a Patent Court bill and some measure for the relief of the Patent Office.

No doubt the prospect of an early and favorable report of the bills substantially as advocated, and the prospects of passage when the bills shall be so reported, are still somewhat uncertain—especially since there exists a class

to whom the present low standards and confusion are profitable. It is however felt that inventors, scientists, engineers, manufacturers and others dealing with patents, share the Patent Office desire, and ought to have prompt, reliable service and adequate protection. The officials of the Patent Office have striven and are still striving vainly with inadequate, underpaid, everchanging forces to meet the demands upon the office. The time seems to have come when the public concerned must view the situation as one involving its own interests and proceed as it would in any other matter to secure what is right and just.

In a sense, "patent reform prospects" may evidently be said now to depend very largely upon the action of those "to whom these patents come."

Bert Russell,
Secretary Patent Office Society

SCIENTIFIC EVENTS

MEMORIAL TO THE LATE FREDERICK DU CANE GODMAN

A committee has been formed under the chairmanship of Lord Rothschild, F.R.S., to establish a memorial to the late Frederick Du Cane Godman, F.R.S., in acknowledgment of his lifelong devotion to the interests of natural history and in grateful testimony of the many valuable benefits conferred by him, in promoting the study of natural science in Great Britain.

At a meeting of the committee held at the Natural History Museum on April 30 last, it was resolved that the memorial should take, primarily, the form of a bronze tablet with medallion portraits of Mr. Godman and of the late Mr. Osbert Salvin, Mr. Godman's lifelong friend and collaborator in all his scientific enterprises, and that this tablet, with a suitable inscription, should be offered to the trustees of the British Museum, to be placed in the Natural History Museum, at South Kensington.

The committee hopes to be in a position to do something additional to perpetuate the memory of Mr. Godman, by helping to establish a less local form of memorial. It is the intention of Dame Alice Godman and her two daughters to found an exploration fund in the interests of the Natural History Museum. For this purpose they have offered to establish a trust with the sum of £5,000, the proceeds of which are to be devoted to making collections for the advancement of science and for the benefit of the museum. This fund is to be called the "Godman Memorial Exploration Fund." Dame Alice's project has met with the warm approval of the trustees of the British Museum. The committee, therefore, propose that any amount received by them over and above that required for the bronze tablet shall be added to the exploration fund. They also hope that this may form a permanent basis for future donations and bequests for the same purpose.

Mr. Godman's work is too well known to need any lengthy exposition here. He and Salvin commenced their zoological exploration of Mexico and Central America in 1860, and carried it on for over 40 years. The material so obtained was used in the preparation of the monumental work, "Biologia Centrali-Americana," consisting of sixty-three quarto volumes, which were published between 1879 and 1915. Of these, fifty-two are devoted to zoology, five to botany, and six to archeology. The "Biologia" certainly constitutes the greatest single work in natural history ever planned and carried out by private individuals, and rivals such national undertakings as the "Challenger Report," which, of course, was financed by the British government. The whole of the vast natural history collections on which the "Biologia" was based were presented by Messrs. Godman and Salvin, and (after the death of Mr. Salvin) by Mr. Godman, to the nation, unfettered by any stipulations, and these collections are now in the National Museum of Natural History. But Mr. Godman's services to science do not rest alone on the publication of his great work. The value of his gifts to the Natural History Museum, apart from the "Biologia" material, must amount to many thousands of pounds, and he was ever ready to help any undertaking for the benefit of his beloved science.

An appeal to him invariably brought forth a favorable response.

The committee will welcome the cooperation of Americans. Contributions should be sent to Mr. C. E. Fagan, honorary treasurer, Godman Memorial Fund, Natural History Museum, Cromwell Road, London, S.W. 7.

EXHIBIT OF MARINE CAMOUFLAGE

THE Brooklyn Museum *Quarterly* describes a special exhibit held at the museum of models, designs and other objects illustrating the practise and some of the principles of marine camouflage. The exhibition was arranged by the curator of the department of natural science, and was made possible through the interest and cooperation of Mr. William A. Mackay, of the United States Shipping Board, camoufleur of the Second Naval District, and Lieutenants Harold Van Buskirk and Everett L. Warner, of the Camouflage Section, Bureau of Construction and Repair, United States Navy. Numerous other naval officers, members of the American Society of Marine Camoufleurs, and others, also contributed to the success of the exhibit by lending illustrative material.

A series of photographs made in the naval laboratories at Washington, D. C., and Rochester, N. Y., showed successive stages of the experimental work by means of which the colors and patterns employed in the camouflage designs had been arrived at. These illustrations included views of the elaborate periscopic "theater" at Rochester, in which painted models of ships were tested under conditions which simulated, in all essential respects, the open ocean. The history of marine camouflage was briefly traced by means of labels and colored models, while approved as well as experimental designs of the "low-visibility" type, the British and American "dazzles," and the French system, were shown by means of models, photographs and colored lithographs issued by the Navy Department.

A case in the center of the exhibition room contained a miniature convoy of transports in charge of a cruiser and a flotilla of destroyers, each camouflaged model an exact replica of its namesake, or, rather, the original working model from which the transport or war vessel had been camouflaged. A simple, illuminated theater, equipped with a periscope, enabled visitors to observe a model as if from a submarine point of view, and, moreover, demonstrated surprisingly well the distortion and other types of illusion produced by the camoufleur's design.

THE PHILADELPHIA MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE fall meeting of the American Chemical Society will be held at the Bellevue-Stratford Hotel, Philadelphia, Pa., under the auspices of the Philadelphia Section, from Tuesday, September 2 to Saturday, September 6, 1919, inclusive. The Philadelphia Section, situated, as it is, so near the center of our chemical activities, is planning an extensive and unusual program and hopes to rival the Buffalo meeting in interest.

The Rubber Division holds its first meeting, and a Dye Section is to be established which will function as a separate section this year. Philadelphia has a large number of chemical industries within its limits and in the surrounding territory, and its large and very enthusiastic local membership, together with the enhanced interest in chemistry manifest throughout the nation, insures a large gathering and an important program. It is already certain that the meeting will be one of the largest, if not the largest, in the history of our society, for we have not only a continually increasing membership, but a continually increasing enthusiasm for the accomplishments of our profession.

Registration will take place at the Bellevue-Stratford, beginning at 3 P.M., Tuesday, September 2. Information Bureau will be located at the Hotel.

The general program is as follows:

TUESDAY, SEPTEMBER 2

4 P.M.—Council meeting at the Bellevue Stratford.

7 P.M.—Dinner for the Council as guests of the Philadelphia Section.

WEDNESDAY, SEPTEMBER 3

9.30 A.M.—General meeting at the Bellevue-Stratford.

Address of Welcome—Honorable Joseph S. MacLoughlin, director of supplies of the city of Philadelphia.

Address by Secretary of War Newton D. Baker.

An address will also be given by a representative of the Navy Department.

2.30 P.M.—General divisional meeting.

8.15 P.M.—Smoker, Scottish Rite Hall, Broad and Race Streets.

THURSDAY, SEPTEMBER 4

9.30 to 1 P.M.—Divisional meetings.

2 P.M.—Excursions to industrial establishments.

8.30 P.M.—Presidential address: "Research and application," Dr. William H. Nichols, at the Museum of the University of Pennsylvania, Thirty-third and Spruce Streets.

FRIDAY, SEPTEMBER 5

9.30 to 1 P.M.—Divisional meetings.

2.30 P.M.—Divisional meetings.

7 P.M.—Banquet at the Bellevue-Stratford

SATURDAY, SEPTEMBER 6

Boat ride, tendered by the Delaware Section. (From 10 A.M. to 4 P.M.)

On Wednesday afternoon as a continuation of the general meeting important papers will be presented by members selected by each division. For the Biological Division, Dr. W. V. Bovie, of the Cancer Commission of Harvard University will present a paper on "Some Physiological Effects by Radiatoring Definite Regions Within a Single Cell." For the Fertilizer Division, Dr. H. J. Wheeler will speak on "Some problems and methods in agricultural research." For the Physical and Inorganic Division, Dr. W. D. Harkins will present a paper on "The structure of the nuclei of atoms and the two periodic systems."

The usual meetings will be held by all the Divisions, with the following special programs: The Industrial Division calls especial attention to its symposium on refractories being organized by Dr. A. V. Bleininger, of the Bureau of Standards, and the discussion which will be held upon Dr. B. C. Hesse's open letter concerning annual patent renewal fees for the United States. The officers urgently request members of the division to contribute to the general program of the division to make the Philadelphia meeting a notable one. The Biological Division will give much thought to chemo-therapy, which is a matter of great interest to the country at present. The Dye Section, which will be organized at this meeting, is preparing an interesting program on the dye situation.

CHARLES L. PARSONS,
Secretary

SCIENTIFIC NOTES AND NEWS

PROFESSOR GUSTAF RETZIUS, the eminent Swedish anatomist and anthropologist, died at Stockholm, on July 21, aged seventy-seven years. Professor Retzius's father and grandfather were distinguished Swedish professors of natural history and anatomy. He was educated at Upsala, and became professor of histology at Stockholm in 1876, and of anatomy in 1889.

PROFESSOR LAWRENCE BRUNER, after thirty years' service in the University of Nebraska, has retired from active charge of the department of entomology. Myron H. Swenk has been placed in charge of all entomological work in the state which comes under the board of regents, this including the department of entomology, the station activities, and the work in connection with the office of state entomologist.

MR. R. L. FARIS, assistant superintendent of the Coast and Geodetic Survey, has been nominated by the president as a civilian member of the Mississippi River Commission, to succeed the late Homer P. Ritter.

PROFESSORS J. M. BRYANT, S. E. Gideon, R. G. Tyler and H. C. Weaver, of the school of mechanical engineering of the University of Texas, who were absent on leave during the session of 1918–19 in war service, will resume their work in October.

IN the National Museum of Wales, Dr. J. J. Simpson has been appointed keeper of zoology and Dr. Ethel N. Thomas keeper of botany.

THE Baly medal of the Royal College of Physicians, awarded to the person who shall

be deemed to have distinguished himself in the science of physiology, especially during the two years immediately preceding, has been awarded this year to Dr. Leonard Hill.

THE Royal Society of Edinburgh has awarded the Makdougall-Brisbane prize for the period 1916–18 to Professor A. Anstruther Lawson, of Sydney, for his papers on cytology and on the gametophytes of various gymnosperms.

MR. J. C. HOSTETTER has resigned from the Geophysical Laboratory of the Carnegie Institution, to take up research and development work for the Steuben Glass Works, of Corning, New York.

DR. F. E. CHIDESTER, in charge of zoology at Rutgers College, until he entered the U. S. Public Health Service, is now engaged in investigations for the U. S. Bureau of Fisheries.

DR. RALPH B. SEEM, assistant superintendent of Johns Hopkins Hospital, has been appointed director of the Billings Hospital of the University of Chicago from January 1, 1921, and assistant consultant on the plans for the hospital.

MAJOR-GENERAL W. C. GORGAS, former Surgeon-General of the United States Army, who has been visiting Central and South American cities with a party of representatives of the Rockefeller Foundation, arrived from the Panama Canal zone at San Salvador on August 20, for the purpose of studying sanitary conditions in this city.

DR. J. WALTER FEWKES, chief of the Bureau of American Ethnology, left for the Mesa Verde in July to continue his work in the archeological development of the park.

MR. E. P. VAN DUZEE, curator of entomology of the California Academy of Sciences, and specialist in the hemiptera, has just returned from a sojourn at Huntington Lake, Fresno county, California. This lake has an elevation of 7,000 feet and the neighborhood is of special interest to entomologists on account of the great abundance of insect fauna. Nearly six thousand specimens were secured which will add a large number of species to the academy collection, some of which are new to science. Dr. F. E. Blaisdell, the coleopterist, accompanied Mr. Van Duzee and also made important collections.

MR. HOYT S. GALE, of the Geological Survey, who has spent several months investigating the potash resources of Europe for the Department of the Interior, has made a study of the deposits of Alsace and of Spain, and will study those of Stassfurt, Germany, before returning to the United States.

PROFESSOR E. W. D. HOLWAY, of the University of Minnesota, and Mrs. Holway, sailed from New York on August 16, on the *Santa Luisa,* for Valparaiso, Chile. They will collect the plant rusts (Uredinales) of the Andes from Chile and western Argentina northward to Ecuador, and expect to be gone about two years.

PROFESSOR DUNCAN S. JOHNSON, Mr. W. E. Seifriz and Mr. L. J. Pessin, of Johns Hopkins University, and Professor C. C. Plitt, of the University of Maryland, have returned from a two months' stay in Jamaica. Most of this time was spent at the Cinchona Botanical Station in the study of liverworts, lianes, epiphyllous plants and lichens. Cinchona proved an admirable place for summer work. In six weeks of June and July there were but two rainy days and three or four days with midday showers. The temperature ranged from 60° to 70° F., occasionally dropping to 58° at nights and once rose to 74° for an hour at midday. It is probable that the Cinchona Station will be available for American botanists during the year 1920.

THE University of Chicago has received a fund of $3,000 from the mother, brother, colleagues and friends of Edith E. Barnard, a former instructor in chemistry, for the endowment of the "Edith Barnard Memorial Fellowship in Chemistry." This fellowship has been temporarily provided through the aid of Mr. and Mrs. Barnard since 1916, but is now permanently endowed.

A NATION-WIDE campaign for funds to erect a hospital in New York City in memory of Dr. Abraham Jacobi is now under way. The

amount set by the committee is $1,000,000, a large part of which is to be devoted to endowment of the institution after it is built. The memorial to Dr. Jacobi, which will be for children only, will probably be erected as an annex to the Jewish Memorial Hospital, but will be non-sectarian in character. The committee desires to endow as many free beds in the hospital as possible as a tribute to Dr. Jacobi's labors among the poor of the city.

Captain Herbert C. Graves, hydrographer in charge of coastal surveys of the Coast and Geodetic Survey, died suddenly in London on July 26, at the age of forty-nine. He had been abroad since June 12 as a representative of the United States at the International Hydrographic Conference, and was also one of the delegates from the American Section of the proposed International Geophysical Union, which met in Brussels in July.

Sir Boverton Redwood, distinguished for his contributions to the study of petroleum, died in London on June 4, at the age of seventy-three years.

The death is announced of Mr. A. W. Ward, since 1889 professor of physics at Canning College, Lucknow, India.

Dr. José G. Herández, one of the most prominent physicians of Venezuela, and known for his scientific work, was killed at Caracas on June 30, in an automobile accident. A period of public mourning has been declared.

It is stated in *Nature* that the meeting of the International Research Council, which was opened at Brussels on July 18 in the presence of the King of the Belgians, concluded its labors on July 28. Much successful work was accomplished. The statutes of the International Council were finally agreed to, and unions embracing the whole subject of astronomy and the various sections of geophysics were formed. In other branches of pure and applied science proposals for the formation of international associations were discussed and formulated. These will have to be submitted to the authorities concerned in the different countries before they can be formally adopted. A resolution inviting the cooperation of nations that had remained neutral during the war was adopted unanimously. Brussels was selected as the legal domicile of the International Research Council. Its triennial meetings will be held in that city, and gifts or legacies will be administered according to Belgian law. But the associations dealing with special subjects will probably follow the established custom of holding their conferences successively in different countries. The secretariat of the council will be at Burlington House, where the Royal Society has placed a room at the disposal of the general secretary.

M. Basile Zaharoff has made a gift of 500,000 francs to the Paris Museum of Natural History to be used in its restoration, enlargement and improvement.

Chemists and assistants on the staff of the Health Department of New York City have joined the Union of Technical Men affiliated with the American Federation of Labor.

The University of California has received the Malcolm P. Anderson collection of scientific specimens of mammals and birds the gift of Mrs. Elizabeth G. Anderson, of Alameda. Mr. Anderson, recently deceased, was a naturalist who carried on field work in Asia for many years in the interests of the British Museum.

UNIVERSITY AND EDUCATIONAL NEWS

It is announced that Yale University will receive approximately $18,000,000, about $3,000,000 in excess of the expectation of the university corporation, from the estate of John W. Sterling.

Edward F. Searles, of San Francisco, has given stock valued at $1,500,000 to the University of California for its unrestricted use.

Dr. T. M. Putnam, professor of mathematics and dean of the undergraduate division in the University of California, has been appointed acting dean of the college of letters and science in the place of the late Professor H. Morse Stephens.

E. B. Brossard, Ph.D., has been appointed head of the department of farm management,

which was recently established at the Utah Agricultural College and Experiment Station.

M. E. GRABER, professor of mathematics at Heidelberg University, has been appointed professor of physics at Morningside College, Sioux City, Iowa.

DR. S. I. KORNHAUSER, formerly associate professor of zoology at Northwestern University and recently relieved from duty in the Sanitary Corps of the Army, has been appointed acting professor of zoology at Denison University in the absence of Professor Fish.

M. PAUL APPELL, dean of the faculty of sciences, Paris, has resigned from the office that he has held for sixteen years and has been succeeded by M. Houssay, professor of zoology.

AT the University of Bristol, Dr. Otto Vernon Darbishire, lecturer in botany, has been promoted to a professorship; Dr. H. Ronald Hassé has been appointed professor of mathematics; Dr. Arthur Mannering Tyndall, professor of physics; George A. Buckmaster, professor of physiology, and Major Andrew Robertson, professor of mechanical engineering.

DISCUSSION AND CORRESPONDENCE

THE VALENCE OF NITROGEN IN NITROUS OXIDE

PROFESSOR W. A. NOYES in his address before the American Association for the Advancement of Science in December, 1918,[1] spoke very convincingly in favor of the theory of positive and negative valences. The work of Falk, Nelson and Fry in attempting to apply the conception of electrons to the theory of valence was commended and the theory of G. N. Lewis with regard to non-polar valencies in organic substances was justly criticized. While pointing out that some of our ideas need revision, Professor Noyes advocated a new formula for the well-known compound, nitrous oxide. According to Noyes, the formula should be $O=N\equiv N$.

Nitrous oxide, N_2O, is usually given the following structural formula:

According to this formula each nitrogen atom is given a valence of three, but two of the bonds from each nitrogen atom are arranged so that they neutralize one another. The oxygen atom is by common consent given a negative valence of two, so that the polarity (*i. e.*, sum of the positive and negative valences) of each nitrogen atom may be regarded as $+1$. According to the conception of positive and negative valences, and in line with Abbegg's assumption that the non-metallic elements exhibit maximum positive and negative valences the sum of which is eight, the nitrogen series embraces at least nine stages which, starting with ammonia, in which nitrogen has a negative valence of three, and ending with nitric acid, in which nitrogen has a positive valence of five, runs as follows:

$$NH_3 - NH_2 \cdot NH_2 - NH_2OH - N_2 - N_2O - NO - N_2O_3(HNO_2) - NO_2 - N_2O_5(HNO_3).$$

The commonly accepted formula for nitrous oxide, which is to be discarded according to Noyes, fits very nicely in this series. In Dr. Noyes's formula, to be sure, he would assume that one nitrogen has a positive valence of five and the other a negative valence of three and, since the algebraic sum of all of the valences on both atoms of nitrogen is $+2$, the average polarity of the nitrogen is $+1$ as in the old formula. It is obvious that this explanation is a little more complicated than that suggested by the old formula.

Professor Noyes justifies his new formula for nitrous oxide by an ingenious explanation of the way in which this substance is formed from ammonium nitrate. In ammonium nitrate, Noyes is willing to admit that one nitrogen has a negative polarity of three and the other a positive valence of five. When ammonium nitrate is heated, Noyes assumes that the salt is decomposed at first into ammonia and nitric acid,

$$NH_4NO_3 \rightleftarrows NH_3 + HNO_3.$$

The ammonia and nitrate acid then tend to form an isomer of ammonium nitrate,

[1] SCIENCE, 44, 175–182, 1919.

$$NH_3 + HNO_3 \rightarrow O=N\begin{matrix}OH\\OH\\NH_2\end{matrix},$$

but this compound is unstable and it loses water to form H_2N_2O,

$$O=N\begin{matrix}OH\\OH\\NH_2\end{matrix} \rightarrow H_2O + O=N\begin{matrix}OH\\\\NH\end{matrix},$$

and finally this H_2N_2O loses another molecule of water to form $O=N\equiv N$ in which one atom of nitrogen has a negative valence of three and the other a positive valence of five as in the original molecule of ammonium nitrate. In other words, neither atom of nitrogen has experienced any change with regard to its state of oxidation.

This hypothesis is certainly no more difficult to understand than many hypotheses which have been advocated in the past by chemists in both the so-called "organic" and "inorganic" fields. It is objectionable, however, because it assumes the formation of two very unstable, hypothetical, intermediate products. These intermediate compounds are certainly not very well known and there appears to be no proof of their formation during the progress of the reaction in question. Such a hypothesis is in line with the assumption of "nascent hydrogen" being formed when a chemical reduction is accomplished by a metal far above hydrogen in the electromotive series and it reminds one of the "primary products" which electro-chemists formerly believed to be formed as a result of electrolysis.

Such an explanation, moreover, is contrary to the evidence which can be deduced from the behavior of other ammonium salts upon ignition. It loses sight of the fact that nitrogen in its lowest state of oxidation is relatively unstable and easily oxidized and of the fact that nitrogen in its highest state of oxidation is easily reduced. In general, when an element is present in a compound in two states of oxidation, the decomposition of the compound is likely to result in the element assuming a state of oxidation intermediate between the two states in which it previously existed.

When ammonium dichromate is heated, nitrogen gas is evolved and chromic oxide is left behind. Heating ammonia sulfate results in the formation of nitrogen and sulfur dioxide. When ammonium nitrate is heated one atom of nitrogen is oxidized to form free nitrogen and the other is reduced to form nitrogen. In this case, Noyes would assume that neither atom of nitrogen is affected by oxidation or reduction but does not all our information with regard to the stability of ammonia and of nitrous acid make it seem simpler to assume that the polarity of nitrogen is zero when in the free condition rather than to insist that one atom has a positive valence of three and the other a negative valence of three?

Finally, Noyes claims that his formula seems more in accord with the ease with which nitrous oxide gives up its oxygen. As one writes the formula on paper it seems very easy to take away the oxygen from the $O=N\equiv N$ molecule and "organic" chemists always love to get atoms on the blackboard where they can easily erase them to show students how new compounds are formed, but it isn't quite clear why ammonium nitrate should withstand strong ignition without any effect upon the state of oxidation of either atom of nitrogen and yet after undergoing all this severe treatment, with the nitrous oxide retaining one nitrogen like that of nitric acid and the other like that of ammonia, be very susceptible to reduction. It would seem far simpler to assume that nitrogen with a valence of one is easily reduced.

The writer has respect for the views of Professor Noyes and has been under obligation to him in the past for helpful advice. He rejoices to learn that Professor Noyes is willing to accept much of the modern theory of valence.

William T. Hall

Cambridge

A SNOW EFFECT

To the Editor of Science: On March 3 of the present year a very interesting snow effect occurred in Orono and vicinity, which is perhaps worth recording in the columns of Science. The writer has not been able to find any one who ever saw a similar effect, and it

would be interesting to know if others have observed anything like it in other localities.

About four inches of light dry snow fell during the afternoon and night of March 2. Towards the end of the storm the flakes were very large and the wind blew at a considerable velocity. This high wind continued most of the day of March 3. After the sun had been shining on the snow for three or four hours and had probably formed a thin layer of moist snow on top, the wind would catch up a portion of this moist snow and roll it over and over, forming a snowball of increasing size until the gust of wind had spent its energy, or the ball had become too large to be rolled any farther. Some people who saw this process taking place said that the fields were literally alive with moving snowballs. This peculiar phenomenon continued until about noon and the fields around Orono and Bangor were left with countless snowballs everywhere. Back of each snowball could be seen the triangular shaped path, from which the snow had been rolled up. In one instance this triangle was found to be approximately thirty-six feet in length, but that was for an unusually large snowball. The snowballs were of all sizes, from two or three inches in diameter up to nearly two feet. Of course the largest ones were formed where the ground sloped so that the ball rolled down hill, but even on the level some of the balls were a foot or more in diameter. One ball in particular, on which measurements were taken and recorded, was elliptical in shape, the horizontal diameter being twenty inches and the vertical diameter being fourteen inches.

LEON ELMER WOODMAN
UNIVERSITY OF MAINE,
ORONO, MAINE

ON MEASURING THE DENSITY OF THE "17-YEAR LOCUST" POPULATION

TO THE EDITOR OF SCIENCE: According to the Bulletin of the Department of Agriculture No. 127, on the "17-year locust" of 1919 there was to be expected a very dense population of locusts this summer in the eastern and southern states. Brood 10 of the "17-year locust" and brood 18 of the "13-year locusts" are coincident this year. One of the items of interest in the periodicity of these insects is the number of individuals appearing from time to time.

I wish to suggest a means of measuring the numbers of them in a manner that will make it easy to compare the density of them from year to year.

Wherever these cicadæ are there is produced an incessant screech. The intensity of this "screechy" sound is dependent upon the density of "locust" population. A measurement of the intensity of this sound may be referred to the density of the population in the environment where the intensity of the sound is produced. This is applying "sound ranging." The proper environment would have to be chosen.

This means would at least afford an excellent way to record the activity of the cicada during any one season; and might be developed to give relative seasonal activity also.

ENOCH KARRER
BUREAU OF STANDARDS

SCIENTIFIC BOOKS

World-Power and Evolution. By ELLSWORTH HUNTINGTON. New Haven, Yale University Press, 287 pp., 30 figures. 1919.

This is a far-reaching book, written in an interesting style, and is suggestive of thought along new lines, not only to students of evolution (especially those interested in the accepted laws of heredity), but to biologists, paleontologists, physicians and statesmen as well. The underlying thesis of the study is organic change, largely brought about by the changing environment, chiefly climate, which affects the well being and health of organisms. "Training, heredity and physical environment are like food, drink and air." They are necessary materials and conditions that are at the basis of all life. Humanity "does not yet realize that the human species must be bred as carefully as race horses," and even when people inherit perfect constitutions their health must receive much care. That climate largely underlies human health, this book abundantly demonstrates, and that it is a *changing* climate that develops the strongest

and most intellectual peoples is clearly set forth.

The author asks:

Have religion, education, philanthropy and government failed? Shall we despair because the church, the school, the charity organization, and the state have not yet destroyed war, pestilence, lust, greed, cruelty and selfishness? Far from it. These agencies can not possibly play their proper parts unless science comes to their aid. Not mechanical science, although that has its useful part to play, but biological science. The sum and substance of biology is evolution, the Darwinian idea that no type of living creature is permanent.

In this book health is studied, not from the standpoint of the physician, but from that of the geographer and evolutionist. Fluctuations in health, even the rise and decline of nations, are found to be conditioned by changes in the climate, in a small way, by the daily and seasonal changes, and in the large by the sweeping climatic ones that historians have as yet made so little use of in their interpretations of the fluctuations in national prosperity. The expansion of great nations

is to a large extent determined by climatic conditions. We talk, indeed, about trade, but back of trade . . . lies the question of health. Health, however, depends chiefly upon air, food and water; and all three of these depend upon climate. Every nation that has been stimulated by an energizing climate has apparently spread its power over neighboring regions either by land or by sea.

The author establishes his argument in a study of Health and Business, followed by other chapters on Business Cycles in Foreign Countries, How Health does its Work, and Climate and Health.

The prosperity curve follows the health curve with no apparent regard for the crops. Contrary as it seems to our established convictions, there appears to be no way of avoiding the conclusion that economic cycles of adversity and prosperity in the United States depend upon health far more than upon any other factor. And health depends largely upon the weather.

Aside from a good inheritance, which is of course the first essential, good health depends upon three material factors—proper food, proper drink and proper air and climate.

Air is the first necessity of life. We may live without food for days and without water for hours; but we can not live without air more than a few minutes. Our air supply is therefore of more importance than our food or water supply, and good ventilation becomes the first rule of hygiene.

Huntington says that it is not enough to understand man's extremely sensitive adjustment to temperature and humidity. We must understand the effect of changes. A *variable* climate has utterly different effects from a uniform climate, even though both have the same average temperature and humidity. This thesis is developed in the section on The Importance of Variability. One of the best possible safeguards of health is constant change of temperature. "We need to return to the conditions under which the evolution of our unclothed ancestors took place."

In the chapter called The Voyage of Evolution, we read of the rise of the organisms into man, and that the last glacial epoch was peculiarly stimulating toward the mental development of humanity. "The coldest places were not favorable, but on their borders where the climate was severe enough to be highly bracing, but not benumbing, there occurred an extraordinary development of brain power." Then follow chapters in The Environment of Mental Evolution, The Origin of New Types among Animals, and The Origin of New Types among Men.

The culminating chapters of the book come next in order. First in the one on The Example of Rome, we are told that mighty Rome fell because "men's energy and power of self-control, as well as their crops, were suffering at the behest of the inexorably changing climate." The human world to the north was disarranged by the same climatic change, and "the barbarians were constantly swooping down first on one part of the empire and then on another." The enervated Romans could not overcome the more vigorous peoples of the north. "So Rome fell, and her fall was followed by that period of unfavorable climate which is known as the Dark Ages."

In the chapter on The Problems of Turkey, we learn that:

In ancient days, when the climate of the Turkish empire was favorable, the ancestors of some of the present inhabitants were the leaders of civilization. To-day their descendants are crushed and discouraged by the insurmountable obstacles of nature. No wonder their spirit is broken, their children ignorant, their religion corrupt, and their government diabolical.

Truly Turkey is the sick nation of Europe, and her civilization corresponds to her physical environment.

This does not mean that she is forever doomed to misgovernment, race hatred and massacre. It does mean, however, that there is little hope of any favorable development from within.

We now attain to the climax of the book in a consideration of Germany and her Neighbors, and the Great War. Racial character, Huntington says, "is the effect of physical environment acting upon generation after generation." The Germans are living in one of the most invigorating climates, one that is superior to that of her enemies who live east and south of them, and it has made them the virile and persisting people that they are.

No other nation in the world has so many people who live under a highly stimulating climate. The German devotion to the national cause is like that which made early Rome so formidable.

Wherever and whenever the climate is stimulating, civilization seems to rise to a high level. The character of the civilization of course varies according to the race and training of the people. Yet no matter what the race, it seems under such circumstances to acquire the power to originate new ideas, to stick to them until they are carried out, and to impress its rule and its civilization upon the less favored people with whom it comes in contact.

CHARLES SCHUCHERT

NEW ACTIVITIES IN THE HISTORY OF SCIENCE

THE active interest in the history of science which exists at the present time in Europe is indicated by the numerous publications which are appearing and announced in this field.

In Italy the journal *Scientia* (*Rivista di Scienza*), *International Review of Scientific Synthesis*, is in its thirteenth year of publication. The present editor is E. Rignano, whose works are favorably known to American readers. This is a monthly publication (subscription at 33 francs per year, Felix Alcan, publishers, Paris), with articles in French, Italian and English, but articles in Italian and English are repeated in French translation. The title indicates the purpose, synthesis of science, of the journal, particularly to counterbalance the ill effects of over-specialization and also to have due regard for the bonds of unity among the different sciences. The social sciences and the history of science are included within the program of this publication. It deserves the hearty support of all scientists, particularly the support by subscription of college and technical libraries and by individuals.

Professor Gino Loria has published for nearly twenty years the quarterly journal, *Bollettino di Bibliografia e Storia delle Scienze Matematiche* (Torino, Rosenberg et Sellier, Via Maria Vittoria, 18). The editor is notable among historians of mathematics as a mathematician of the first rank, contributing equally to the field of pure mathematics and to the history of the science. This journal is always interesting and instructive, particularly valuable to all students of mathematics.

In March of this year appeared the first number of a new Italian publication, quarterly, devoted entirely to the history of science, the *Archivio di Storia della Scienza*. The editor, Professor Aldo Mieli, of the University of Rome, is a well-known contributor to the fields of the history and philosophy of the sciences. Each volume of the *Archivio* will consist of about 500 pages (foreign subscription 35 francs, Dott Attilio Nardecchia, Via dell'Umilta, 14, Rome 19). While particular attention is to be paid to Italian science and scientists, all publications in the history of the various sciences and relating to the philosophy and development of science come within the range of the journal.

The first number contains the following articles and departments: G. B. De Toni, "Francesco Griselini, viaggiatore e natural-

ista veneziano del sec. XVIII."; Ant. Favaro, "Matteo Carosio (Amici e corrispondenti di Galileo. XLI.)"; Gino Loria, "Per una storia della matematica nel secolo XIX."; Andrea Corsini, "L'influenza' oggi e nel passato"; Studi e Note Vinciane Proemio, D. T. Per l'edizione nazionale delle opere di Leonardo, Notizie varie; Bibliografia metodica dei lavori di storia della scienza publicati in Italia; Analisi critiche: R. Almagià, Cristoforo Colombo (G. Stefanini); U. Viviana, Andrea Cesalpino; R. Marcolongo, Il problema dei tre corpi; W. Libby, An Introduction to the History of Science (A. Mieli); Gli Scienziati Italiani, Aggiunte, note e discussiono; Notizie e Commenti: Organizzazioni italiane per promuovere lo studio della storia della scienza (A. Mieli). La storia della scienza nelle Università—Notizie varie.

Due credit must be given, even to-day, to the Germans for their activity in the publication of journals of an international character. However, Americans should now realize the desirabiiity of stimulating and encouraging Italian, English and other European scientific publications of an international character. The revived Belgian journal *Isis*, now published by Dr. George Sarton and Dr. Charles Singer, of Oxford, should be remembered in this connection.

The best way to stimulate these publications is by personal subscription and by personal interest on the part of scientists in urging upon librarians the subscription to these enterprises.

Louis C. Karpinski
University of Michigan

SPECIAL ARTICLES

THE MOTION OF A GRAVITATING NEEDLE[1]

1. *Static Elongations.*—The apparatus[2] with which I am working is of the simplest character, but judiciously designed. Two shots ($m = .6$ gram), one at each end of a straw shaft 22 cm. long (diagram 1*a*), are supported by a long quartz fiber, fixed with cement above and below. The attracting weight ($M = 1$ kilog., or more) can easily be moved from one side to the other and definitely placed by a smooth-working crank mechanism, between stops. Observations are made in a dark room (except for distant lamp light), in a damp, semi-subterranean basement, in midsummer, with very fair constancy of temperature and no electric charges. The motion of the needle is essentially creeping with a period (if I may so call it) of 20 or 30 minutes. The scale distance is over 4 meters from the little mirror at the center of the shaft. The observer keeps out of the way.

Under these circumstances reasonably constant scale deflections, for periods of alternation exceeding 30 minutes would be expected; but the reverse of the case. Here is an example of the successive mean excursions or double amplitudes of the needle during the day:

July	16	17	18	19	20
Scale displacement in cm	2.79	3.02	3.27	2.79	3.65
July	21	22	23	25	25
Scale displacement in cm	4.03	3.64	3.07	4.50	5.39

The values of the morning and afternoon readings were equally different. Individual excursions may run as high as 6 cm. on certain days, though the behavior is throughout, of course, quite systematic.

2. *Triplets for three-minute Periods.*—The results for short period alternations of the pull of M (3 minutes in the examples given, Figs. 1, 2, 3) are equally bizarre; though, here they become interesting. In Fig. 1, the turning points of M are indicated by little circles, R and L are pulls to right and to left, respectively, and the mean double amplitude of the successive triplets are marked on the curves. There is drift throughout the figure; otherwise the behavior is about what would be expected. Inertia apparently carries the ball a little time after the gravitational pull has changed sign. But for this, there would be a phase difference of 90° as there should be. Moreover, the motion of the needle, after turning, is uniform.

[1] Advance note from a Report to the Carnegie Institution of Washington, D. C.

[2] *Proc. Nat. Ac. Sc.*, IV., 338, 1918.

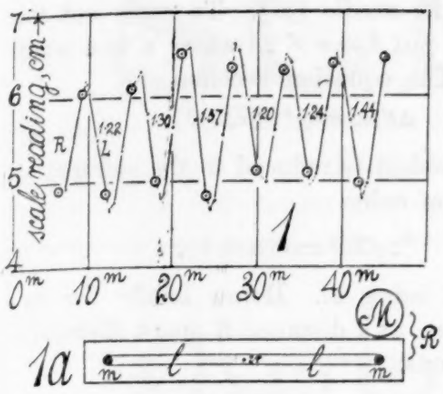

FIG. 1.

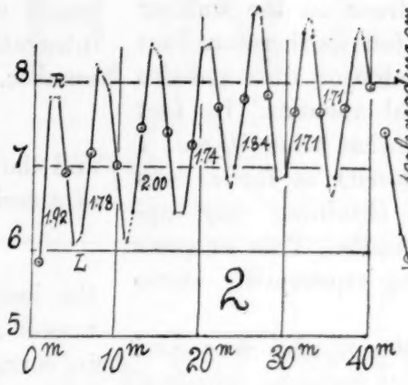

FIG. 2.

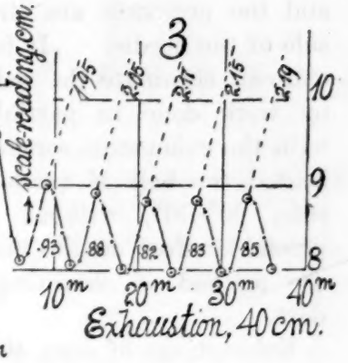

FIG. 3.

In Fig. 2, made under the same circumstances on a different day, the phenomenon is totally changed. The needle turns in the middle of the interval between the turning times of the pulling weight. There is no phase difference, while the drift has been accentuated. The triplets are larger, though the motion within the branches is still uniform. Similar observations were obtained with a downward drift. So I might adduce examples with all kinds of phase-differences, in some of which what was called "inertia" in relation to Fig. 1, comes just *before* the reversal of the pull! For the same reason alternations in periods of one minute each rarely succeed.

It is obvious therefore, that in addition to the gravitational attraction there is in all these cases evidence of the development of an attractive (or in Fig. 2, of a repulsive) force more or less rapidly after the weight is turned.

3. *Radiation.*—The extraneous forces originating in M are clearly referable to radiation. We may argue plausibly that, if M be warmer than m, there is excess of convection on the M side and a corresponding part of the pressure is converted into kinetic energy. Attraction apparently results. In the opposite case (colder M), there is repulsion such as is evidenced, for instance, after the semi-periods in Fig. 2. The relative magnitude of the radiation forces is astonishing. One has merely to warm the ball M with the hands, in order to increase the "gravitational attraction" five or ten times. Again on cooling the ball in tap water only a few degrees below that of the room, repulsion may be obtained. Thus when the external temperatures are increasing even if very slowly, outside objects like M are hotter and the excursions of § 1 are large; and vice versa.

The warmer ball remains effectively though decreasingly so, for hours, even when it has become cold to the touch. Normal experiments are not again feasible until the day after.

4. *Radiation in Vacuo.*—At this point it was therefore necessary to build another apparatus, capable of being exhausted. This was done, and experiments similar to the last performed, by exhausting the interior in successive steps of 0–10 cm., 10–20 cm., etc. Thus again the interior was cooled relative to the exterior and there was an influx of radiation, the character of which was made evident by hanging the needle somewhat obliquely to the vertical walls of the case.[3] The ball M was discarded. It was found that the attractive forces obtained in each of these successive steps of exhaustion (allowing the needle to get back to equilibrium before the next step) gradually diminished with the decrease of pressure, until between 60 and 70 cm., there was no appreciable effect. For higher exhaustions (70–74 cm.) the attractive forces were reversed and became strong repulsive forces.[4] In other words at this point the radiometer forces supervene

[3] I give this explanation with some reservations. All that is in question is a reversible inequality of radiation on the two sides.

[4] Deflections of $+15$ cm. and -15 cm. were observed, respectively, at the first and last drop of pressure, whereas the gravitational deflection is but 3 or 4 cm.

and the pressures are larger on the warmer side of the needle. It follows therefore that one can eliminate the radiation discrepancies by work done in partial vacuum. In fact with the exhaustion somewhat below 70 cm., I heated the ball M (restored) as far as was safe, 60°–70°, without obtaining any appreciable effect on the needle. This suggests the method of obtaining trustworthy static data.

Exhaustions of even 40 cm. give very good results. In Fig. 3 for instance, obtained with the new apparatus (scale distance 265 cm., therefore less sensitive), there is no drift and the whole motion soon becomes steady, so that the triplets (data given on the curve) become repetitions of each other. Between the turning points the motion is uniform.

A further important result was substantiated. The size of the triplets, or better the speed of uniform motion between the turning points was the same, independent of pressure, from a plenum up to 70 cm. In Fig. 3 some of these speeds are given as displacements per 5 minutes inscribed on the lines prolonged. Improvement would not be difficult. Hence these resistances independent of the pressure or density of the air must be due purely to the viscosity of the medium and it must be possible to express the gravitational attraction in terms of the viscosity of air. This project is further elucidated tentatively, in the next paragraph.

5. *Tentative Estimate.*—The resistance experienced by a sphere of radius, r moving in a viscous fluid (η) with the velocity $v = l\omega$, is well known to be $6\pi\eta rv$. I do not happen to be familiar with the corresponding expression for a cylinder of radius r, semi-length l and with hemispherical ends, moving broadsides on. To get a mere order of values, however, I will postulate, that for equal frontal areas,

$$\pi r^2 = 2r \cdot \Delta l$$

the resistances are alike. Thus the element of resistance is

$$dF = 6\pi\eta rv = 6\sqrt{\pi}\eta l\omega\sqrt{\pi r^2} = 6\sqrt{\pi}l\omega\sqrt{2r \cdot \Delta l} = \omega\eta\sqrt{24\pi r\Delta(l^3)}$$

and this is to be integrated for the double length of the needle ($2l$). To carry out the integration put $l = n \times 2r$ where n is a serial number. The equation becomes

$$\Delta F = 8\omega\eta r^2\sqrt{3\pi\Delta(n^3)}$$

and the problem is reduced to the summation of a series of cubes

$$2\sqrt{\Sigma n^3} = n(n+1),$$

the length being $2l$. Hence finally for two masses M, m, at a distance R apart, disregarding corrections,

$$\gamma = 8\sqrt{3\pi}\eta\omega(R^2/Mm)n(n+1).$$

The constants of the second apparatus were:

$$M = 1602 \text{ grams}, \quad m = .563 \text{ grams},$$

$$R = 5.1 \text{ cm.}, \quad 2r = .4 \text{ cm.}, \quad 2l = 22.8 \text{ cm.}, \quad \eta = .00019, \quad n = 28.5.$$

In Fig. 3, the last three scale rates have the mean value 2.17 per 5 minutes, or

$$\omega = 2.17/300 \times 530 = .00001364$$

radians per second, the scale being off 265 cm. Inserting these data into the equation, $\gamma = .10^{-8} \times 6.2$, which is much closer to the standard value than, from the improvised apparatus and inadequate theory, I had expected to get. It sufficiently substantiates, I think, the assumed purely viscous character of the resistance and moreover shows that the constant of gravitation may probably be found, with precision, in terms of the resistance, in air, to the uniform motion, broad-sides on, of a cylinder with hemispherical ends.

Carl Barus

Brown University,
Providence, R. I.

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA. GARRISON, N. Y.
NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter